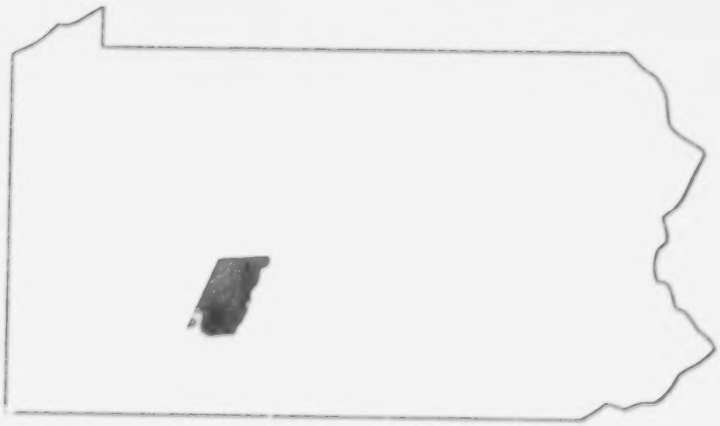
FLOOD INSURANCE STUDY

TOWNSHIP OF CROYLE, PENNSYLVANIA
CAMBRIA COUNTY



AUGUST 15, 1990

Federal Emergency Management Agency

COMMUNITY NUMBER - **421439**

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision (LOMR) process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Flood Insurance Study Effective Date: August 15, 1990

Flood Insurance Study Revised:

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FLOOD INSURANCE STUDY
TOWNSHIP OF CROYLE, CAMBRIA COUNTY, PENNSYLVANIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Township of Croyle, Cambria County, Pennsylvania, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the U. S. Geological Survey (USGS) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-85-E-1824, Project Order No. 8. This work was completed in July 1987.

1.3 Coordination

On December 20, 1984, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the township, and the USGS (the study contractor) to determine the streams to be studied by detailed methods.

On February 2, 1989, a final CCO meeting was held with representatives of FEMA, the township, and the study contractor to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Township of Croyle, Cambria County, Pennsylvania. The area of study is shown on the Vicinity Map (Figure 1).

The following streams were studied by detailed methods: the Little Conemaugh River, from the downstream corporate limits to the corporate limits of the Borough of Summerhill, approximately 410 feet downstream of the upper bridge on State Route 53; the South Fork Little Conemaugh River, from the downstream corporate limits to a point approximately 1,200 feet upstream of State Route 160, and from a point approximately 400 feet downstream of State Route 869 to the upstream corporate limits; and Laurel Run, from its confluence with the South Fork Little Conemaugh River to a point approximately 570 feet upstream of State Route 160. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through July 1992.

Birch Run; Mud Run; and the remaining portions of the Little Conemaugh River, the South Fork Little Conemaugh River, and Laurel Run were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the Township of Croyle.

2.2 Community Description

The Township of Croyle is located in the southern portion of Cambria County in southwestern Pennsylvania, approximately 10 miles east of Johnstown. It is bordered by the Township of Cambria to the north, the Township of Summerhill to the east, the Township of Adams to the south, and the Townships of East Taylor and Jackson and the Borough of South Fork to the west.

2.3 Principal Flood Problems

Major floods cause localized inundation of structures along the Little Conemaugh River, the South Fork Little Conemaugh River, and Laurel Run.

2.4 Flood Protection Measures

No flood control measures have been taken to alleviate flooding within the Township of Croyle; however, a flood-control levee has been proposed along the South Fork Little Conemaugh River at Sidman. Since construction has not yet begun, the effects of that levee have not been incorporated into this study.

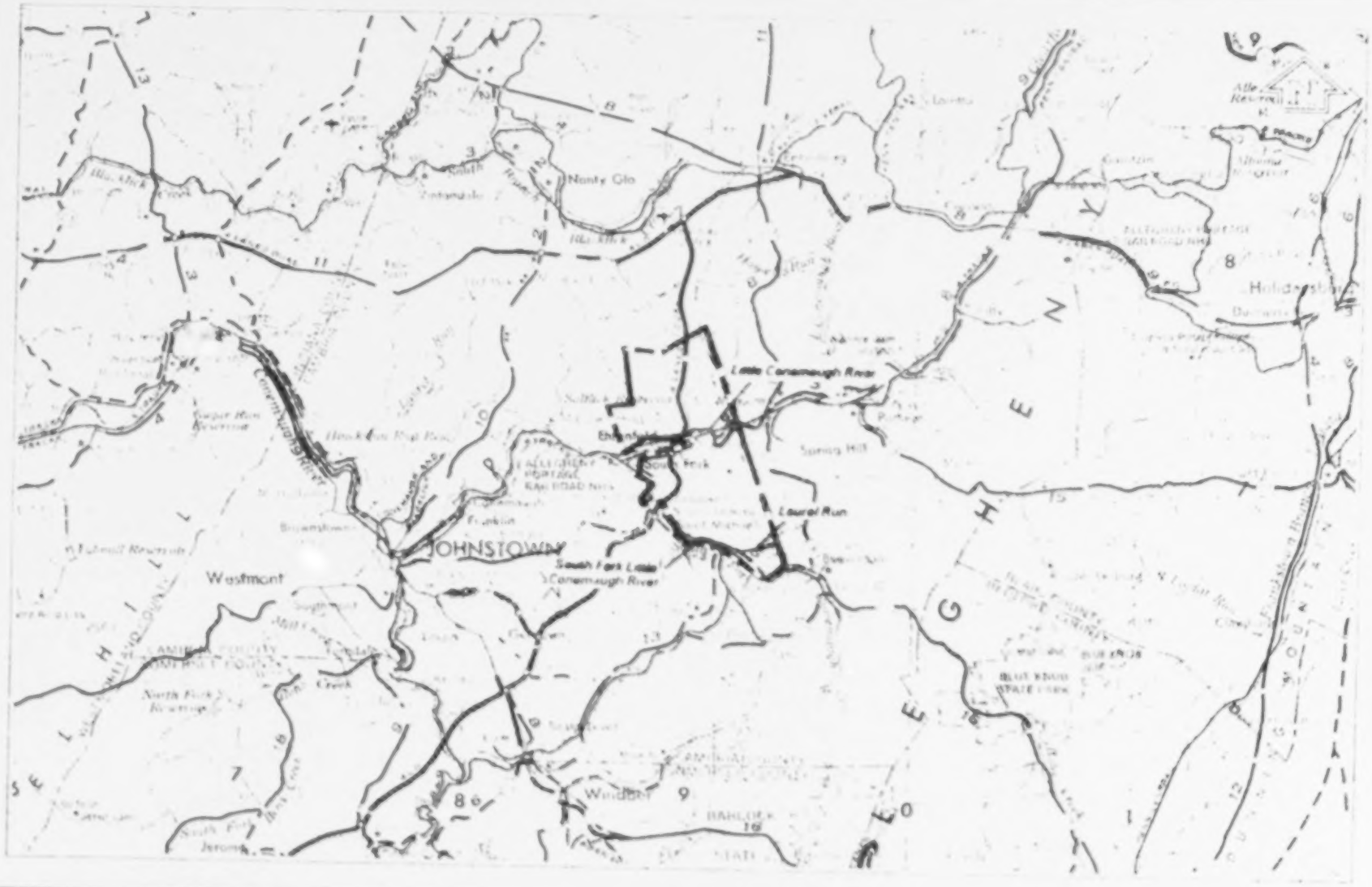


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF CROYLE, PA

(CAMBRIA CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. A flood event of a magnitude which is expected to be equaled or exceeded once on the average during any 100-year period (recurrence interval) has been selected as having special significance for floodplain management and for flood insurance rates. This event, commonly termed the 100-year flood, has a 1 percent chance of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

The flood-frequency discharge values for the Little Conemaugh River and the South Fork Little Conemaugh River were determined using data collected from the Little Conemaugh River at East Conemaugh (stream gage No. 03041000) and the methods outlined in USGS Bulletin 17B (Reference 1). For Laurel Run, flood-frequency discharge values were determined utilizing regional regression equations developed in USGS Water Resources Investigations 82-21 (Reference 2). These flood-frequency values were then adjusted based on the ratio of flood-frequency values calculated for stream gage No. 03041000 by the two methods (References 1 and 2).

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGE (cfs) 100-YEAR
LITTLE CONEMAUGH RIVER		
At downstream corporate limits	96	15,000
At U. S. Route 219	92	14,400
Above confluence with Laurel Run at Borough of Summerhill	85.8	13,400

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGE (cfs) 100-YEAR
SOUTH FORK LITTLE CONEMAUGH RIVER		
At downstream corporate limits	63.5	10,980
Above confluence with Sandy Run	52.6	9,530
At railroad bridge at Village of Saint Michael	49.3	9,080
Above confluence with unnamed tributary at Village of Saint Michael	47.2	8,790
Above T-352 at Village of Creslo	45.7	8,580
Above confluence with Laurel Run At Village of Sidman	35.9	7,150
Above confluence with Otto Run	25.9	5,600
At Village of Allendale	24.5	5,370
At upstream corporate limits	23.1	5,140
LAUREL RUN		
At confluence with the South Fork Little Conemaugh River	9.79	2,700
At T-330	9.41	2,600
At State Route 160 at Village of Sidman	8.53	2,430

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections were field surveyed and located at close intervals above and below bridges and culverts in order to compute the significant backwater effects of these structures. All bridges, dams, and culverts in the community were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and the Flood Insurance Rate Map (Exhibit 2) where applicable.

Water-surface elevations for floods of the selected recurrence interval for the South Fork Little Conemaugh River from the downstream corporate limits to a point approximately 1.4 miles upstream and from a point approximately 2.4 miles upstream of the downstream corporate limits to a point approximately 4.1 miles upstream, and for the Little Conemaugh River were computed by modeling channel and bridge hydraulics with the USGS WSPRO step-backwater computer program (References 3 and 4). The starting

water-surface elevations were determined by normal-depth calculations. For the remaining portions of the South Fork Little Conemaugh River, and for Laurel Run, normal depths of flooding for the 100-year recurrence interval were estimated from the regional relationship between drainage area and flood depth prepared by the USGS (Reference 5). This relationship was developed by means of regional regression analyses of basin areas and 100-year within-channel depths observed at stream gages. Depths were adjusted on the basis of hydraulic calculations to account for increased depth due to backwater from hydraulic structures, such as bridges and culverts (References 3, 4, and 6). Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

Channel roughness factors (Manning's "n") used in the hydraulic computations were assigned on the basis of engineering judgment and field inspection of the floodplain areas. The channel "n" values for the streams studied by detailed methods ranged from 0.034 to 0.039, and the overbank "n" values ranged from 0.045 to 0.150.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. For the streams studied in detail, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 20 feet (Reference 7).

For the streams studied by approximate methods, the 100-year floodplain boundaries were delineated using the Flood Hazard Boundary Map for the Township of Croyle (Reference 8).

The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

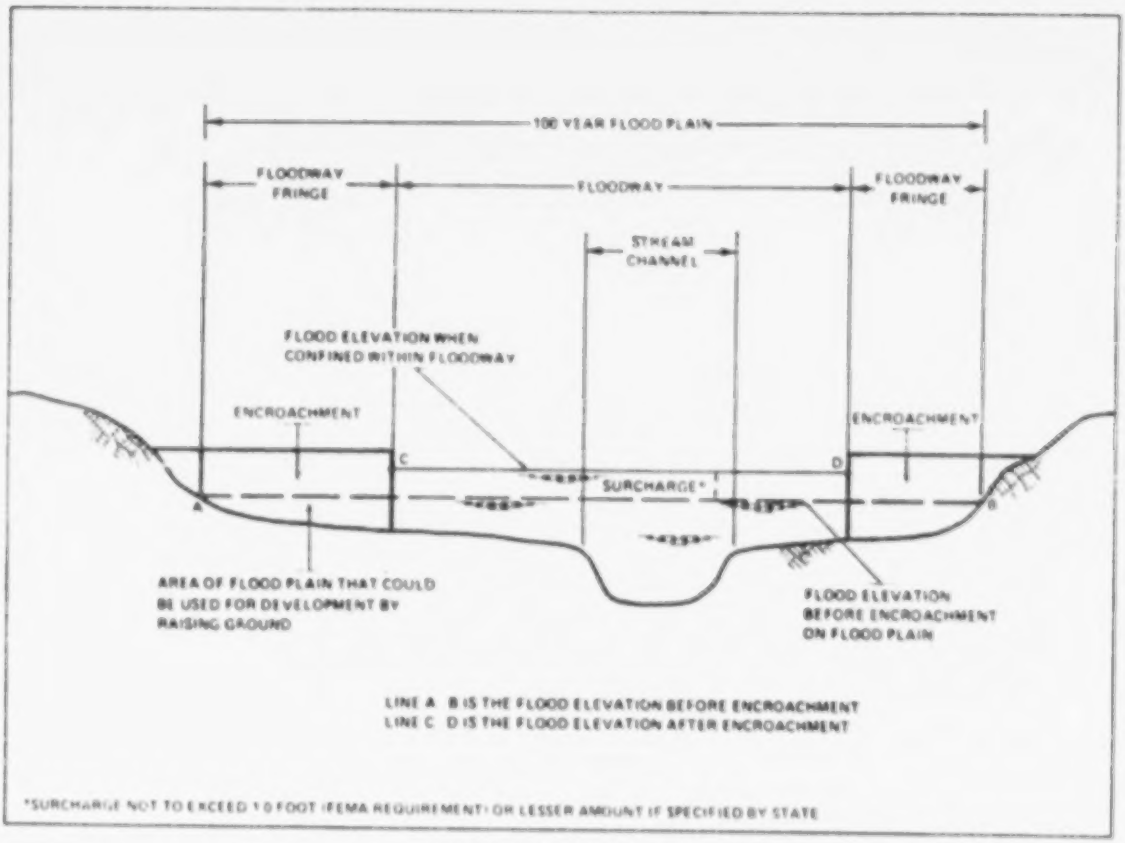
No floodways were calculated as part of this study.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FLOODWAY SCHEMATIC Figure 2

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100-year floodplain. The locations of selected cross sections used in the hydraulic analyses are shown where applicable.

7.0 OTHER STUDIES

Flood Insurance Studies have been prepared for the Townships of Adams and East Taylor; and the Boroughs of South Fork, Ehrenfeld, and Summerhill (References 9, 10, 11, 12, and 13). The results of those studies are in exact agreement with the results of this study.

Due to its more detailed nature, this study supersedes the Flood Hazard Boundary Map for the Township of Croyle (Reference 8).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Liberty Square Building (Second Floor), 105 South Seventh Street, Philadelphia, Pennsylvania 19106.

9.0 BIBLIOGRAPHY AND REFERENCES

1. U. S. Department of the Interior, Geological Survey, Office of Water Data Collection, Interagency Advisory Committee on Water Data, "Guidelines for Determining Flood Flow Frequency," Bulletin 17B, Reston, Virginia, Revised September 1981.

2. U. S. Department of the Interior, Geological Survey, Water Resources Investigations 82-21, Evaluation of the Streamflow-Data Program in Pennsylvania by H. N. Flippo, Jr., Harrisburg, Pennsylvania, 1982.

3. U. S. Federal Highway Administration, Report FHWA/RD-86/108, Bridge Waterways Analysis Model/Research Report by J. O. Shearman, W. H. Kirby, V. R. Schneider, and H. N. Flippo, Jr., Washington, D. C., 1986.

4. National Technical Information Service, Bridge Waterways Analysis Model/User's Instructions by J. O. Shearman, W. H. Kirby, and V. R. Schneider, Springfield, Virginia, 1985.

5. U. S. Department of the Interior, Geological Survey, Water Resources Investigations 86-4195, Technique for Estimating Depths of 100-year Floods in Pennsylvania by N. N. Flippo, Jr., Harrisburg, Pennsylvania, 1986.

6. U. S. Department of the Interior, Geological Survey, Techniques of Water Resources Investigations, Measurement of Peak Discharge at Culverts by Indirect Methods by G. L. Bodhaine, Washington, D. C., 1968.

7. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 Feet: Beaverdale, Pennsylvania, 1963, Photorevised 1981; Geistown, Pennsylvania, 1964, Photorevised 1981; Nanty Glo, Pennsylvania, 1964, Photorevised 1981.

8. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Township of Croyle, Cambria County, Pennsylvania, November 22, 1974.

9. Federal Emergency Management Agency, Flood Insurance Study, Township of Adams, Cambria County, Pennsylvania, Washington, D. C., August 15, 1990.

10. Federal Emergency Management Agency, Flood Insurance Study, Township of East Taylor, Cambria County, Pennsylvania, Washington, D. C., April 2, 1990.

11. Federal Emergency Management Agency, Flood Insurance Study, Borough of South Fork, Cambria County, Pennsylvania, Washington, D. C., March 19, 1990.

12. Federal Emergency Management Agency, Flood Insurance Study, Borough of Ehrenfeld, Cambria County, Pennsylvania, Washington, D. C., March 19, 1990.

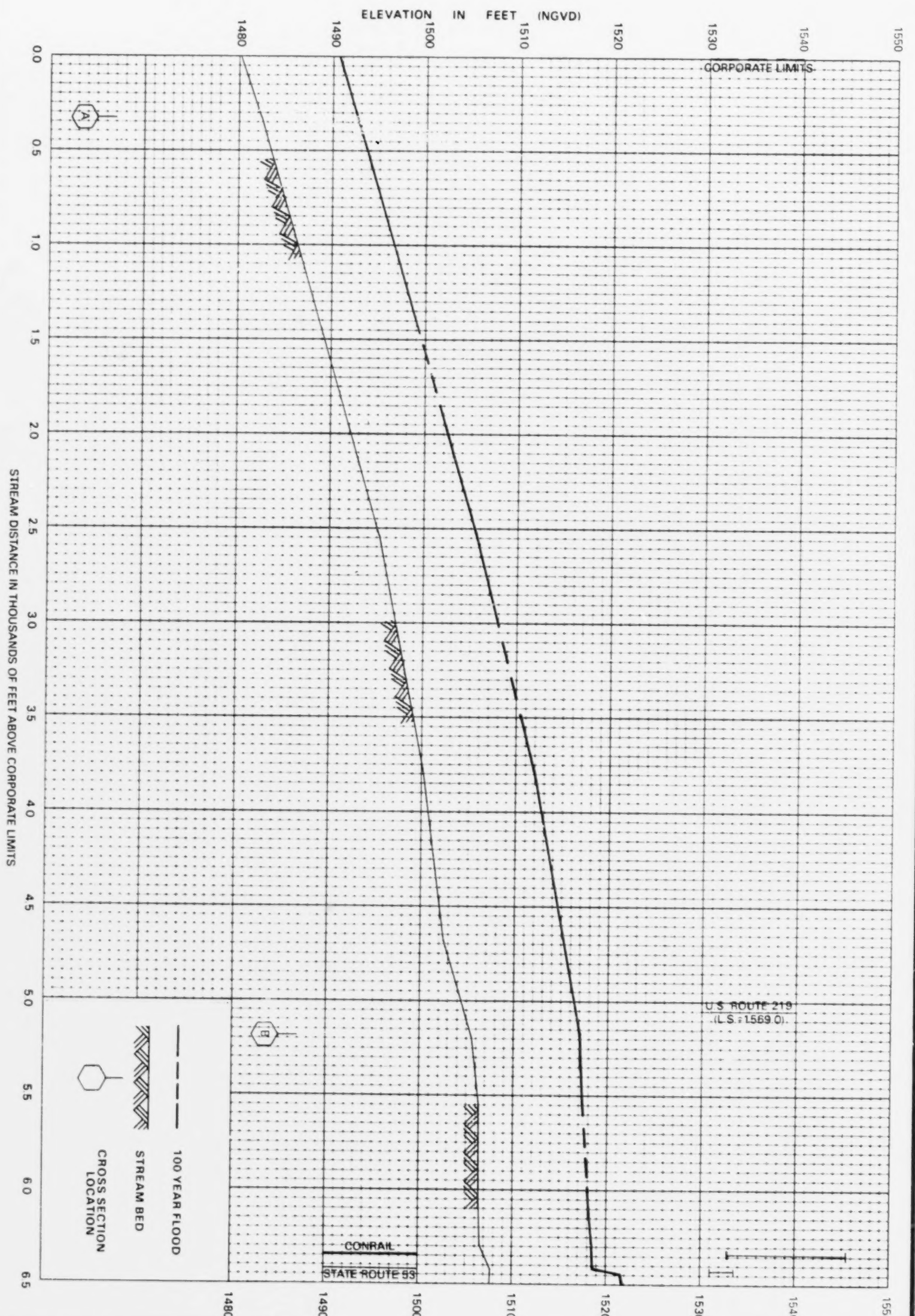
13. Federal Emergency Management Agency, Flood Insurance Study, Borough of Summerhill, Cambria County, Pennsylvania, Washington, D. C., March 19, 1990.

EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 1	11	1,545.65	Standard disk, stamped D 346 1966, set on top of southeast concrete headwall of CONRAIL bridge over the Little Conemaugh River in Borough of Ehrenfeld.
RM 2	11	1,539.25	PDH disk, stamped C 346 1965, set on top of southwest concrete wing wall of State Route 53 bridge over Laurel Run at Borough of Summerhill.
RM 3	13	1,549.76	PDH tablet on southeast wing wall of bridge on T-381 (Township of Adams) over Sandy Run, approximately 450 feet upstream of confluence with the South Fork Little Conemaugh River.
RM 4	13	1,581.30	Mine spike in utility pole No. 13526 at northeast side of State Route 869 bridge over unnamed tributary to the South Fork Little Conemaugh River approximately 1,000 feet east of Village of Saint Michael.
RM 5	13	1,598.48	Chiseled square cut on southeast wing wall of T-352 bridge over the South Fork Little Conemaugh River at Village of Creslo.
RM 6	13	1,621.20	Standard disk, stamped 26 DOP 1962 1621, set in concrete post, approximately 48 feet east of northeast corner of power relay station, approximately 17 feet west of centerline of T-330, approximately 1 foot southeast of power pole, and approximately 0.5 mile north of Sidman.
RM 7	14	1,645.22	Chiseled square cut on southwest wing wall of State Route 160/869 bridge over Otto Run at Sidman.
RM 8	14	1,648.99	Chiseled square cut on northwest wing wall of State Route 160/869 bridge over the South Fork Little Conemaugh River at Sidman.

EXHIBIT 3 - ELEVATION REFERENCE MARKS - continued

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 9	14	1,761.06	Standard disk, stamped 93 WHC 1962 1761, in southeast abutment of CONRAIL bridge in Village of Allendale.



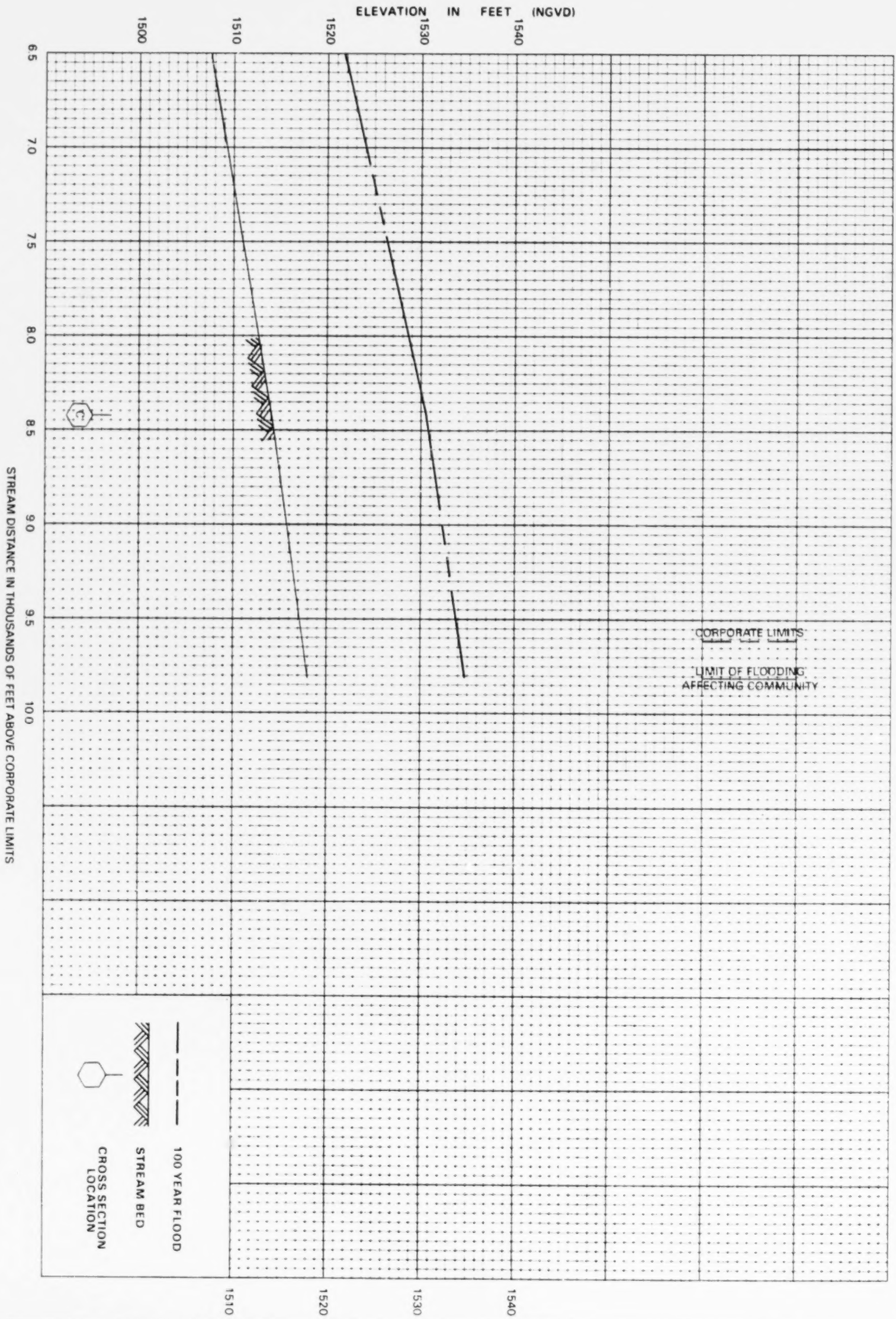
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF CROYLE, PA
(CAMBRIA CO.)

FLOOD PROFILES

LITTLE CONEMAUGH RIVER

01P



FEDERAL EMERGENCY MANAGEMENT AGENCY

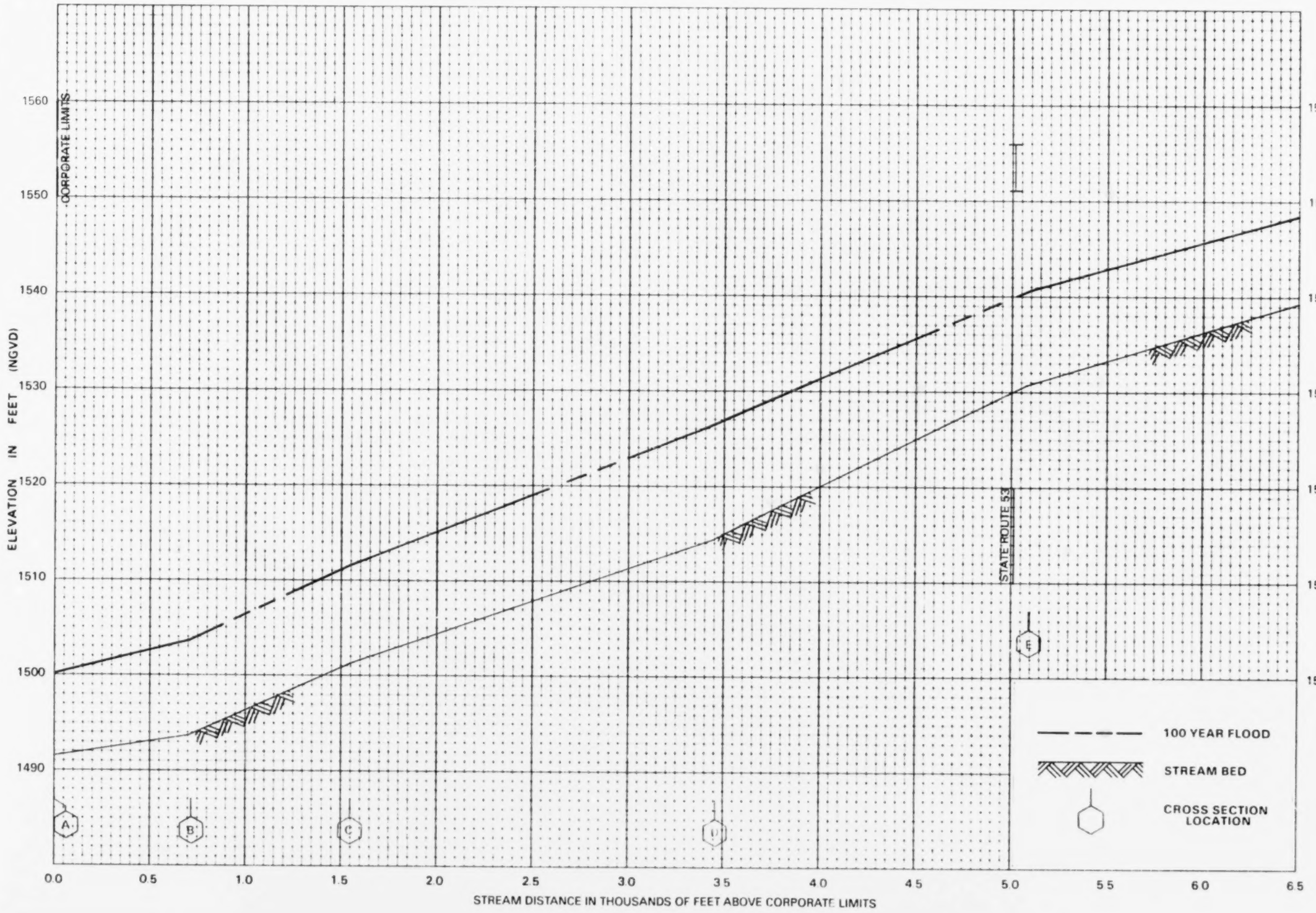
TOWNSHIP OF CROYLE, PA

(CAMBRIA CO.)

FLOOD PROFILES

LITTLE CONEMAUGH RIVER

02P



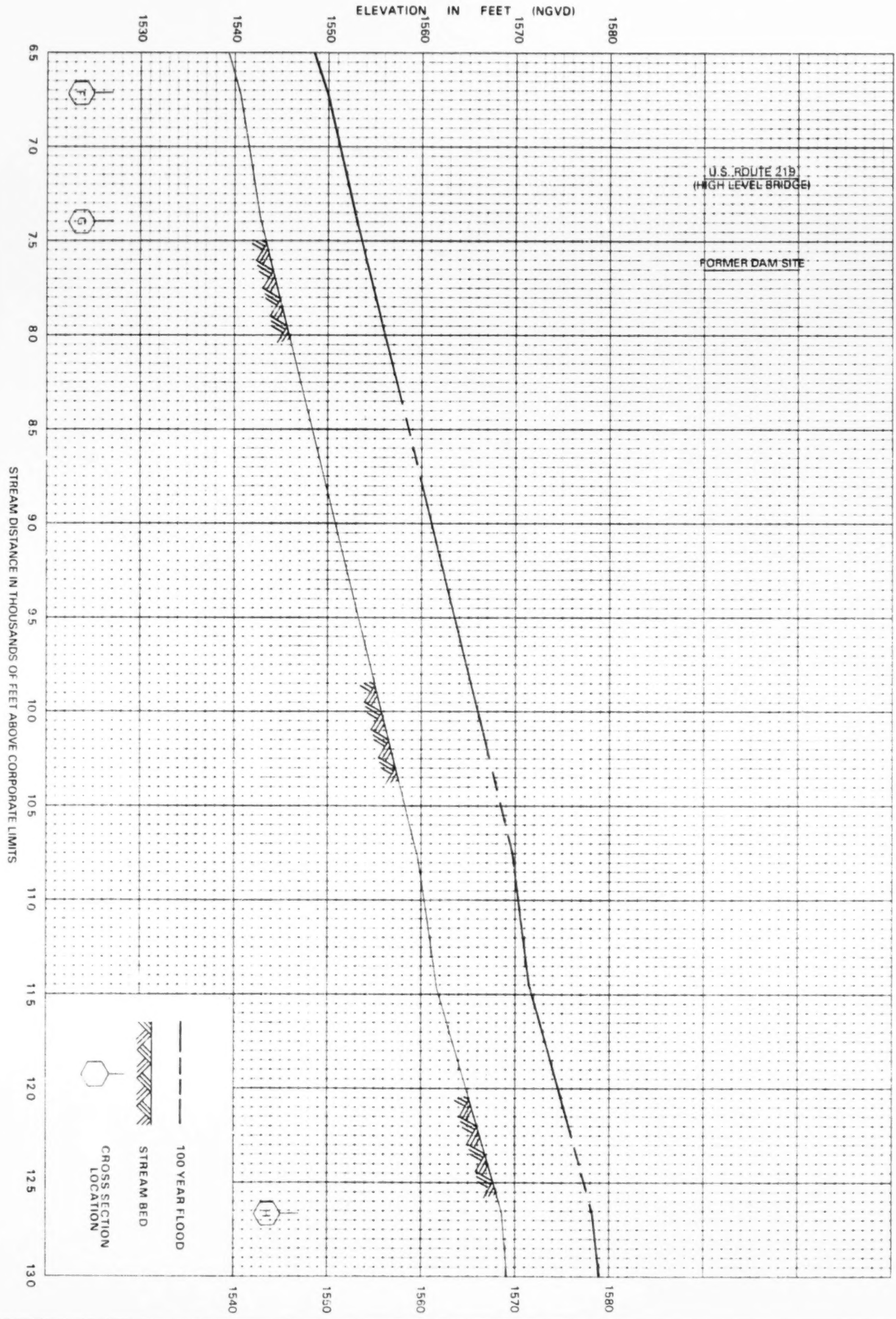
FLOOD PROFILES

SOUTH FORK LITTLE CONEMAUGH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF CROYLE, PA
(CAMBRIA CO.)

03P



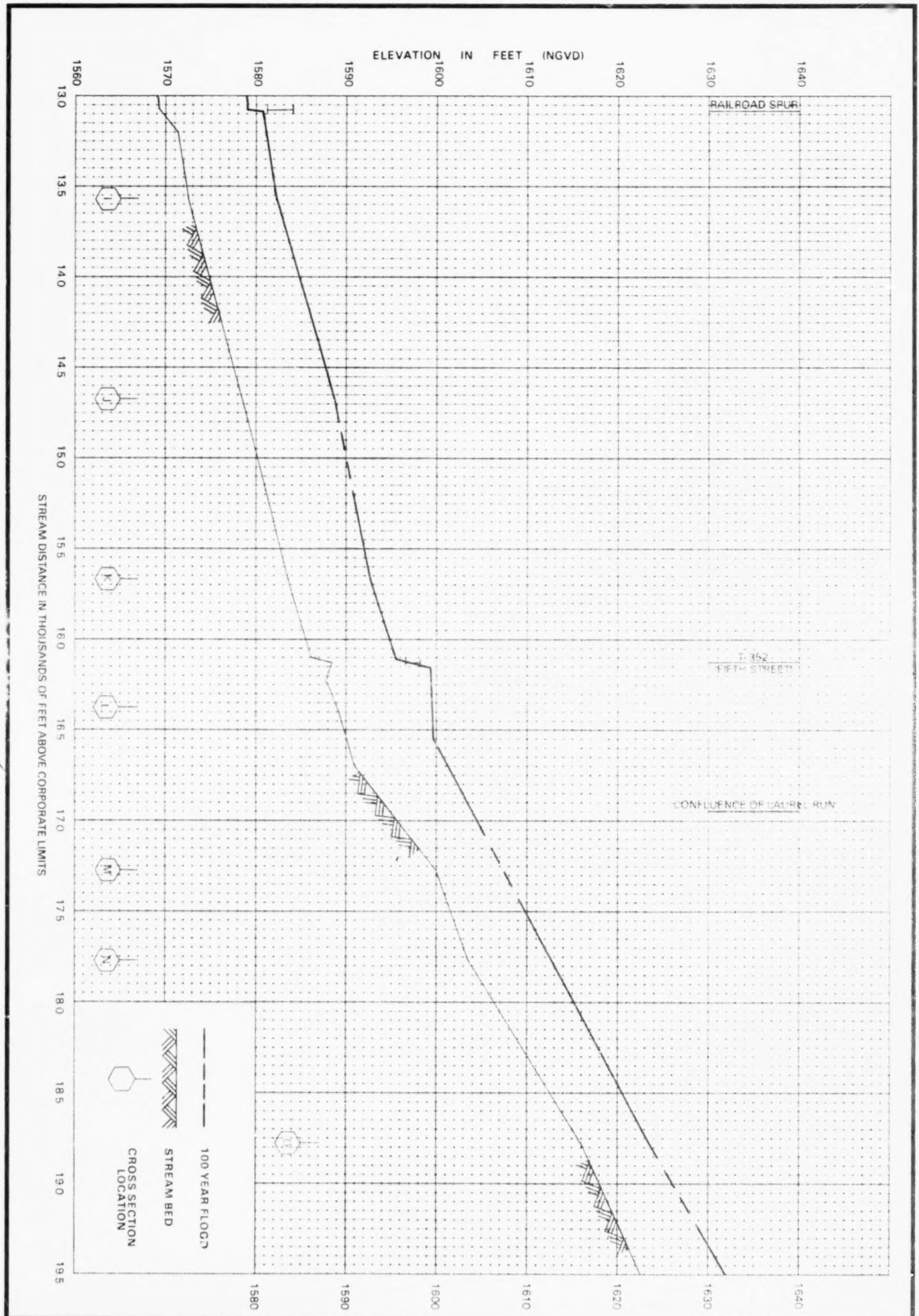
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF CROYLE, PA
(CAMBRIA CO.)

FLOOD PROFILES

SOUTH FORK LITTLE CONEMAUGH RIVER

04P



FEDERAL EMERGENCY MANAGEMENT AGENCY

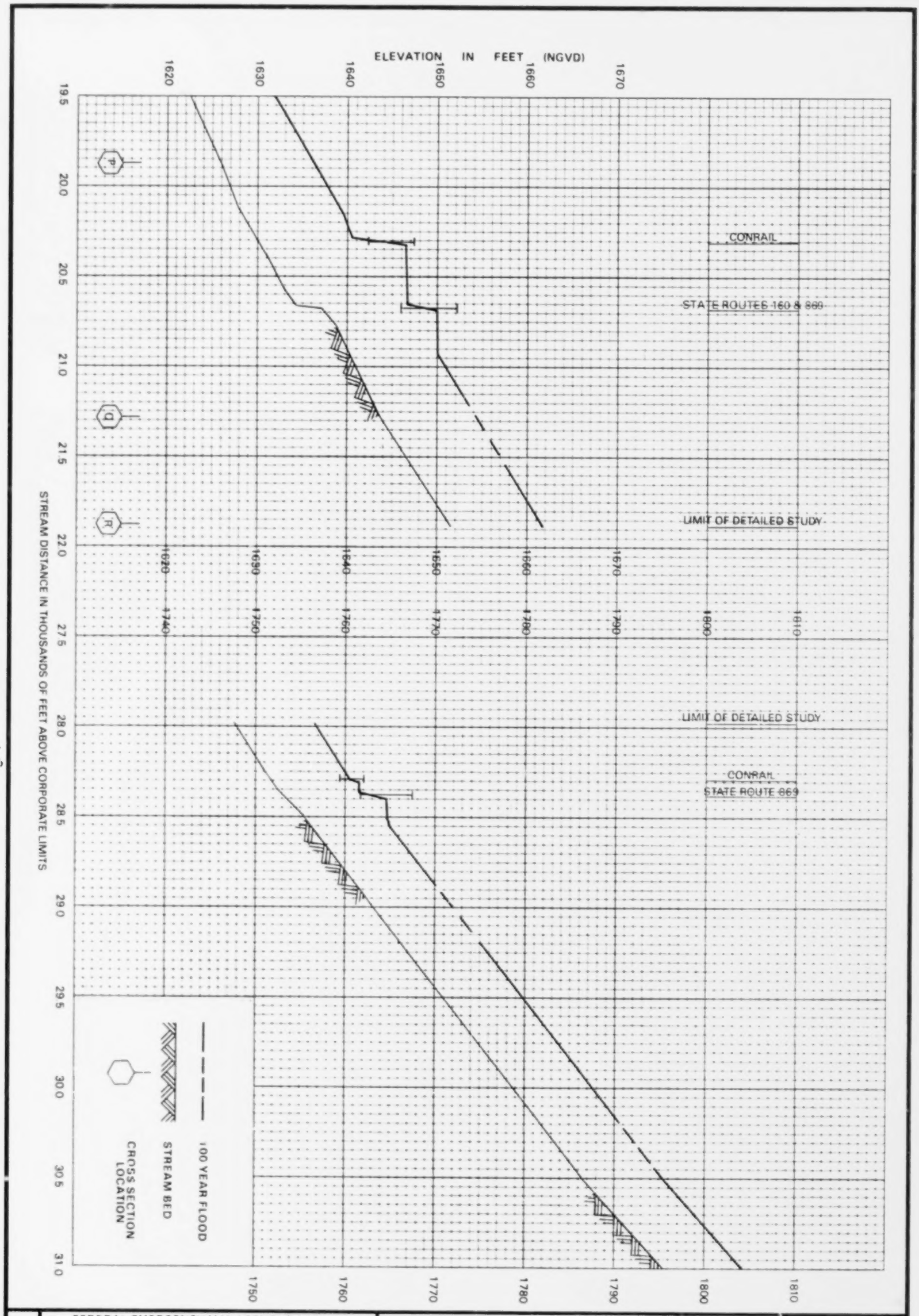
TOWNSHIP OF CROYLE, PA

(CAMBRIA CO.)

FLOOD PROFILES

SOUTH FORK LITTLE CONEMAUGH RIVER

05P



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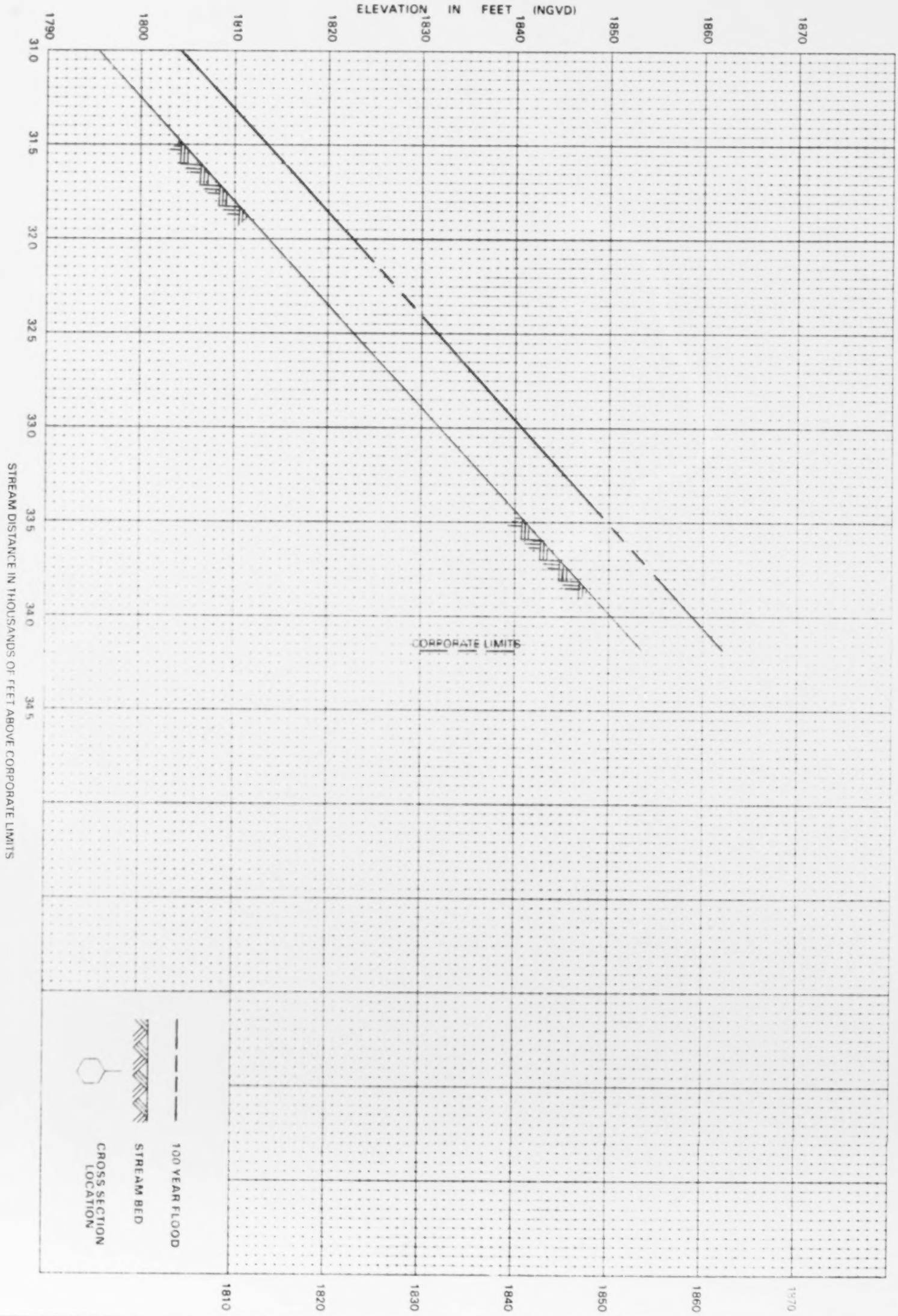
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF CROYLE, PA
(CAMBRIA CO.)

FLOOD PROFILES

SOUTH FORK LITTLE CONEMAUGH RIVER

06P



07P

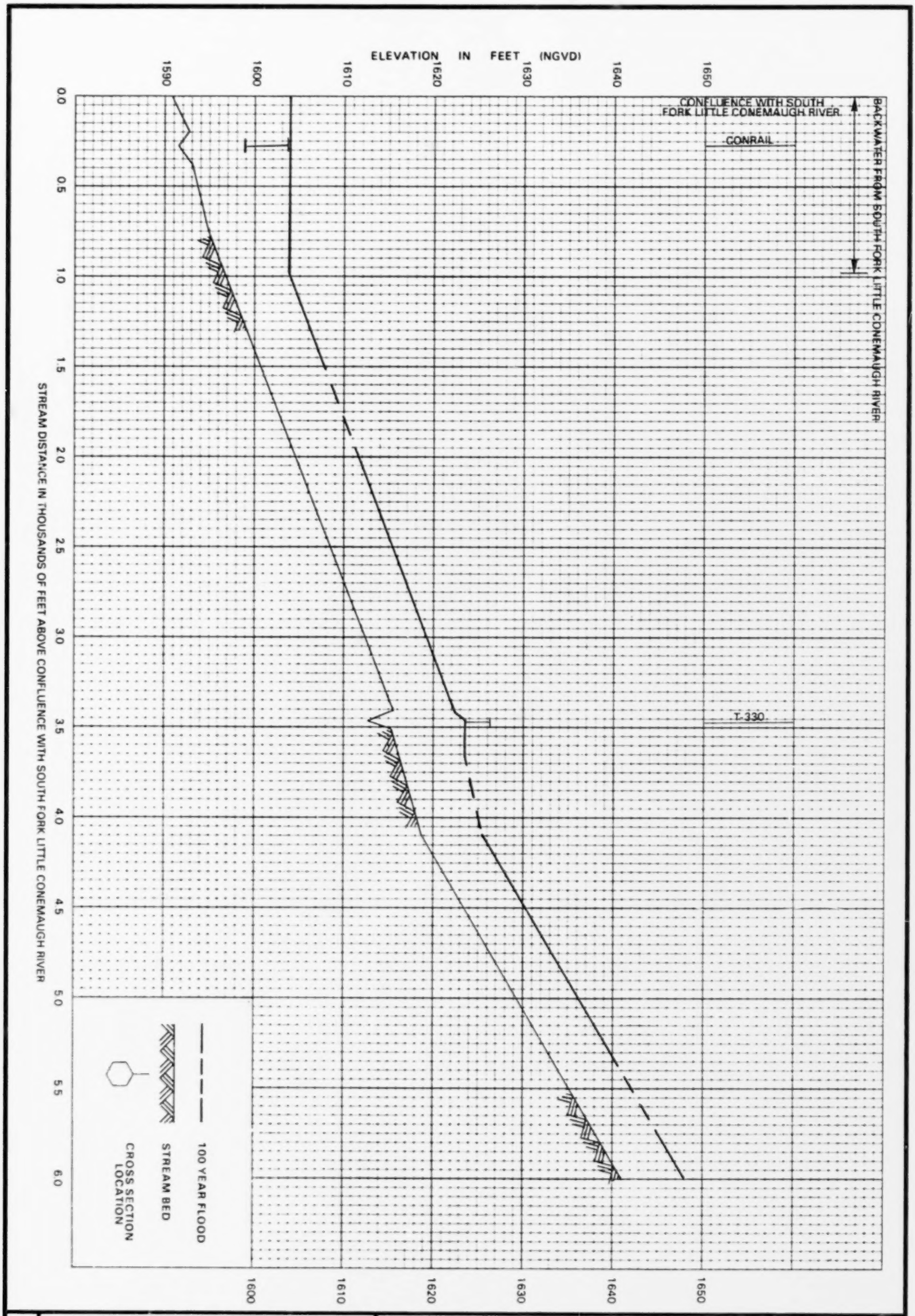
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF CROYLE, PA

(CAMBRIA CO.)

FLOOD PROFILES

SOUTH FORK LITTLE CONEMAUGH RIVER



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FEDERAL EMERGENCY MANAGEMENT AGENCY

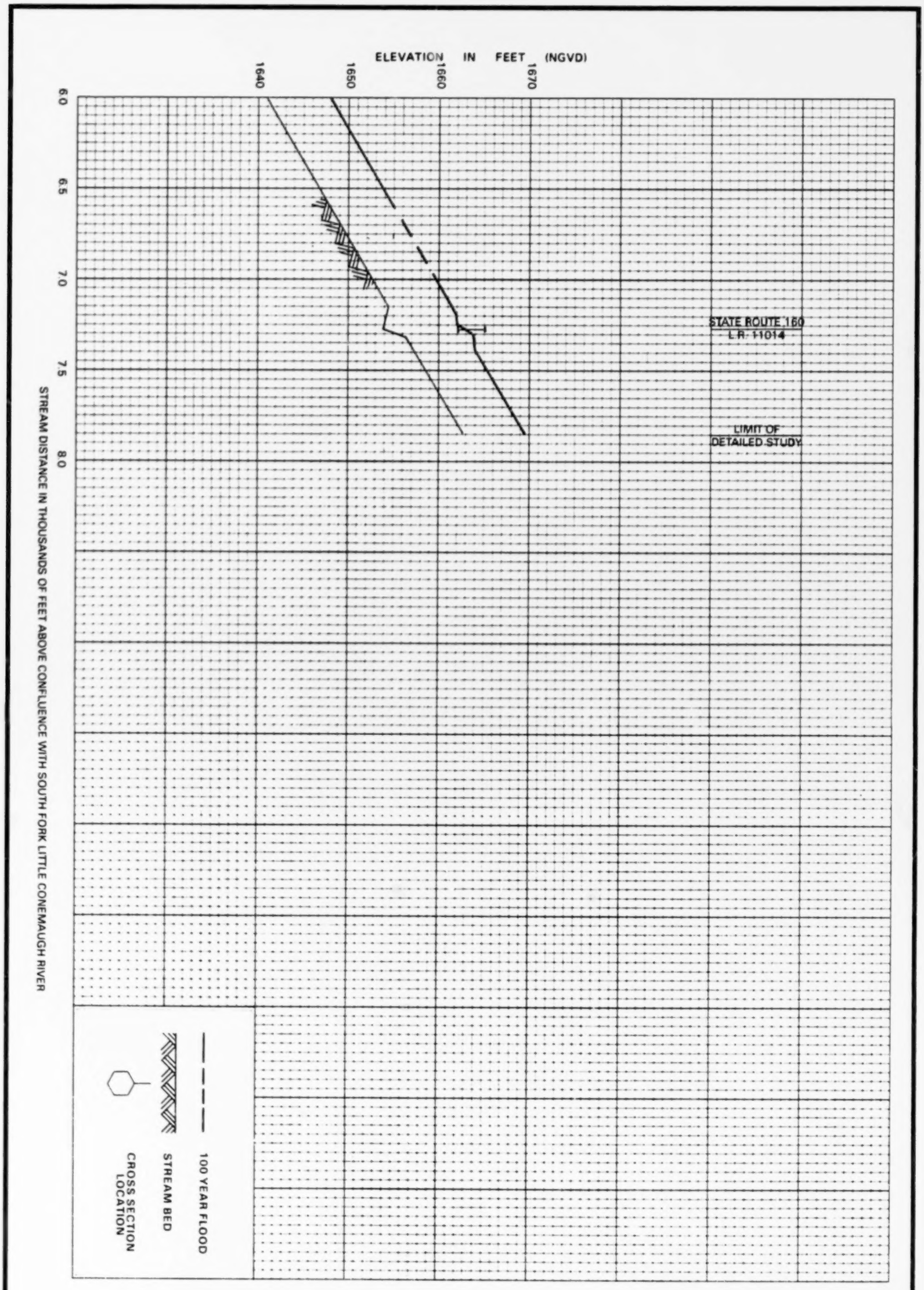
TOWNSHIP OF CROYLE, PA

(CAMBRIA CO.)

FLOOD PROFILES

LAUREL RUN

21



FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF CROYLE, PA

(CAMBRIA CO.)

FLOOD PROFILES

LAUREL RUN

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